

WHAT IS CLAIMED IS:

1. An I.V. flush syringe assembly comprising:

5 a barrel including a cylindrical side wall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

10 a plunger including an elongate body portion having a proximal end, a distal end and a resilient stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel; and

15 means for moving fluid distally in said passageway after fluid has been delivered from said chamber and said stopper is in contact with said distal wall.

2. The syringe assembly of claim 1 wherein said means for moving fluid comprises said stopper including a distal end having a distal surface and a proximal end having a cavity therein defining an inside surface, said distal end of said plunger connected to said stopper by a complementary detent structure defining a first detent position and a second detent position, said detent structure being configured so that a distally directed force applied to said plunger after fluid has been delivered from said chamber causes said plunger to move distally with respect to said stopper from said first detent position to said second detent position so that a distal tip on said distal end of said plunger contacts said inside surface of said stopper forcing part of said distal end of said stopper into said passageway to move fluid distally in said passageway.

3. The syringe assembly of claim 1 wherein said stopper includes a conically shaped distal surface and said inside surface of said barrel at said distal wall being conically shaped wherein said total included angle of said inside surface of said barrel at said distal wall is greater than said total included angle of said stopper distal surface.

4. The syringe assembly of claim 2 further including a distally directed projection on said distal end of said stopper shaped to fit in said passageway when said plunger and said stopper are engaged in said second detent position.

5 5. The syringe assembly of claim 2 wherein said inside surface of said stopper includes a proximally directed protuberance configured to contact said distal tip of said plunger when said plunger and said stopper are engaged in said second detent position.

6. The syringe assembly of claim 2 wherein said inside surface of said stopper  
10 includes a first discontinuity and a second discontinuity located distally from said first discontinuity, and said distal end of said plunger includes a discontinuity positioned so that when said stopper and said plunger are in said first detent position said plunger discontinuity engages said first discontinuity and when said stopper and said plunger are in said second detent position said plunger discontinuity engages said second discontinuity.

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7. The syringe assembly of claim 6 wherein said discontinuity on said distal end of said plunger includes a raised projection.

8. The syringe assembly of claim 7 wherein said raised projection is an annular  
20 ring.

9. The syringe assembly of claim 8 wherein said first discontinuity is a recess for containing said raised projection on said distal end of said plunger.

25 10. The syringe assembly of claim 9 wherein said recess is annularly shaped.

11. The syringe assembly of claim 1 including flush solution in said chamber.

12. The syringe assembly of claim 11 further including a tip cap releasably  
30 connected to said tip of said syringe barrel for sealing said passageway.

13. The syringe assembly of claim 11 wherein said flush solution is selected from the group consisting of saline flush solution and heparin lock flush solution.

14. The syringe assembly of claim 1 wherein said stopper is made of material  
5 selected from the list consisting of thermoplastic elastomers, natural rubber, synthetic rubber, thermoplastic materials and combinations thereof.

15. The syringe assembly of claim 1 further comprising a needle assembly  
10 including a cannula having a proximal end, a distal end and a lumen therethrough, and a hub having an open proximal end containing a cavity and a distal end attached to said proximal end of said cannula so that said lumen is in fluid communication with said cavity, said needle assembly being removably attached to said tip of said barrel through engagement of said tip to said cavity so that said lumen is in fluid communication with said chamber.

16. The syringe assembly of claim 2 further including a spring between said  
15 distal tip and said distal end of said plunger, said spring configured to compress when said plunger moves to said second detent position with respect to said stopper.

17. The syringe assembly of claim 2 further including said barrel and said  
20 plunger having complementary detent structures defining a primary detent position and a secondary detent position to hold the position of said plunger relative to said barrel, said primary detent position being positioned to engage when fluid has been delivered from said chamber and said stopper is in contact with said distal wall, said secondary detent position being engaged upon application of said distally directed force to said plunger.

18. The syringe assembly of claim 17 wherein said proximal end of said barrel  
25 includes a first discontinuity and a second discontinuity located distally from said first discontinuity and said proximal end of said plunger includes a discontinuity positioned so that when said plunger and said barrel are in said primary detent position said proximal  
30 plunger discontinuity engages said first barrel discontinuity and when said plunger and said barrel are in said secondary detent position said proximal plunger discontinuity engages said second barrel discontinuity.

19. The syringe assembly of claim 18 wherein said proximal plunger discontinuity is an outwardly directed projection.

5 20. The syringe assembly of claim 19 wherein said outwardly directed projection is an annular ring.

21. The syringe assembly of claim 19 wherein said second barrel discontinuity is a recess for containing said proximal plunger discontinuity.

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22. The syringe assembly of claim 17 wherein said plunger includes a radial projection positioned so that when said plunger and said barrel are in said primary detent position said radial projection engages said inside surface of said barrel and when said plunger and said barrel are in said secondary detent positions, said radial projection engages  
15 said inside surface of said barrel at a position located distally from said primary detent position.

23. An I.V. flush syringe assembly comprising:

20 a barrel including a cylindrical side wall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

a tip cap releasably connected to said elongate tip for sealing said passageway;

25 a plunger including an elongate body portion having a proximal end, a distal end and a resilient stopper, a quantity of flush solution in said chamber, said stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said stopper including a conically shaped distal surface and said inside surface of said barrel at said distal wall being conically shaped wherein said total included angle of said  
30 inside surface of said barrel at said distal wall is greater than said total included angle of said stopper distal surface, said elongate body portion extending outwardly from said open proximal end of said barrel; and

means for moving fluid distally in said passageway after fluid has been delivered from said chamber and said stopper is in contact with said distal wall including said stopper having a distal end having a distal surface and a proximal end having a cavity therein defining an inside surface, said distal end of said plunger connected to said stopper by a complementary detent structure defining a first detent position and a second detent position, said detent structure being configured so that an additional distally directed force applied to said plunger after fluid has been delivered from said chamber causes said plunger to move distally with respect to said stopper from said first detent position to said second detent position so that a distal tip on said distal end of said plunger contacts said inside surface of said stopper forcing part of said distal end of said stopper into said passageway to move fluid distally in said passageway.

24. The syringe assembly of claim 23 further including a distally directed projection on said distal end of said stopper shaped to fit in said passageway when said plunger and said stopper are engaged in said second detent position.

25. The syringe assembly of claim 23 wherein said inside surface of said stopper includes a proximally directed protuberance configured to contact said distal tip of said plunger when said plunger and said stopper are engaged in said second detent position.

26. An I.V. flush syringe assembly comprising:  
a barrel including a cylindrical side wall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

a tip cap releasably connected to said elongate tip for sealing said passageway;  
a plunger including an elongate body portion having a proximal end, a distal end and a resilient stopper, a quantity of flush solution in said chamber, said stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel; and

means for moving fluid distally in said passageway after fluid has been delivered from said chamber and said stopper is in contact with said distal wall including said stopper having a distal end having a distal surface and a proximal end having a cavity therein defining an inside surface, said distal end of said plunger connected to said stopper by a complementary detent structure defining a first detent position and a second detent position, said detent structure being configured so that a distally directed force applied to said plunger after fluid has been delivered from said chamber causes said plunger to move distally with respect to said stopper from said first detent position to said second detent position so that a distal tip on said distal end of said plunger contacts said inside surface of said stopper forcing part of said distal end of said stopper into said passageway to move fluid distally in said passageway;

a spring between said distal tip and said distal end of said plunger, said spring configured to compress when said plunger moves to said second detent position with respect to said stopper; and

said barrel and said plunger having complementary detent structures defining a primary detent position and a secondary detent position to hold the position of said plunger relative to said barrel, said primary detent position being positioned to engage when fluid has been delivered from said chamber and said stopper is in contact with said distal wall, said secondary detent position being engaged upon application of said additional distally directed force to said plunger.

27. The syringe assembly of claim 26 further including a distally directed projection on said distal end of said stopper shaped to fit in said passageway when said plunger and said stopper are engaged in said second detent position.

28. The syringe assembly of claim 26 wherein said inside surface of said stopper includes a proximally directed protuberance configured to contact said distal tip of said plunger when said plunger and said stopper are engaged in said second detent position.